Fig. 1

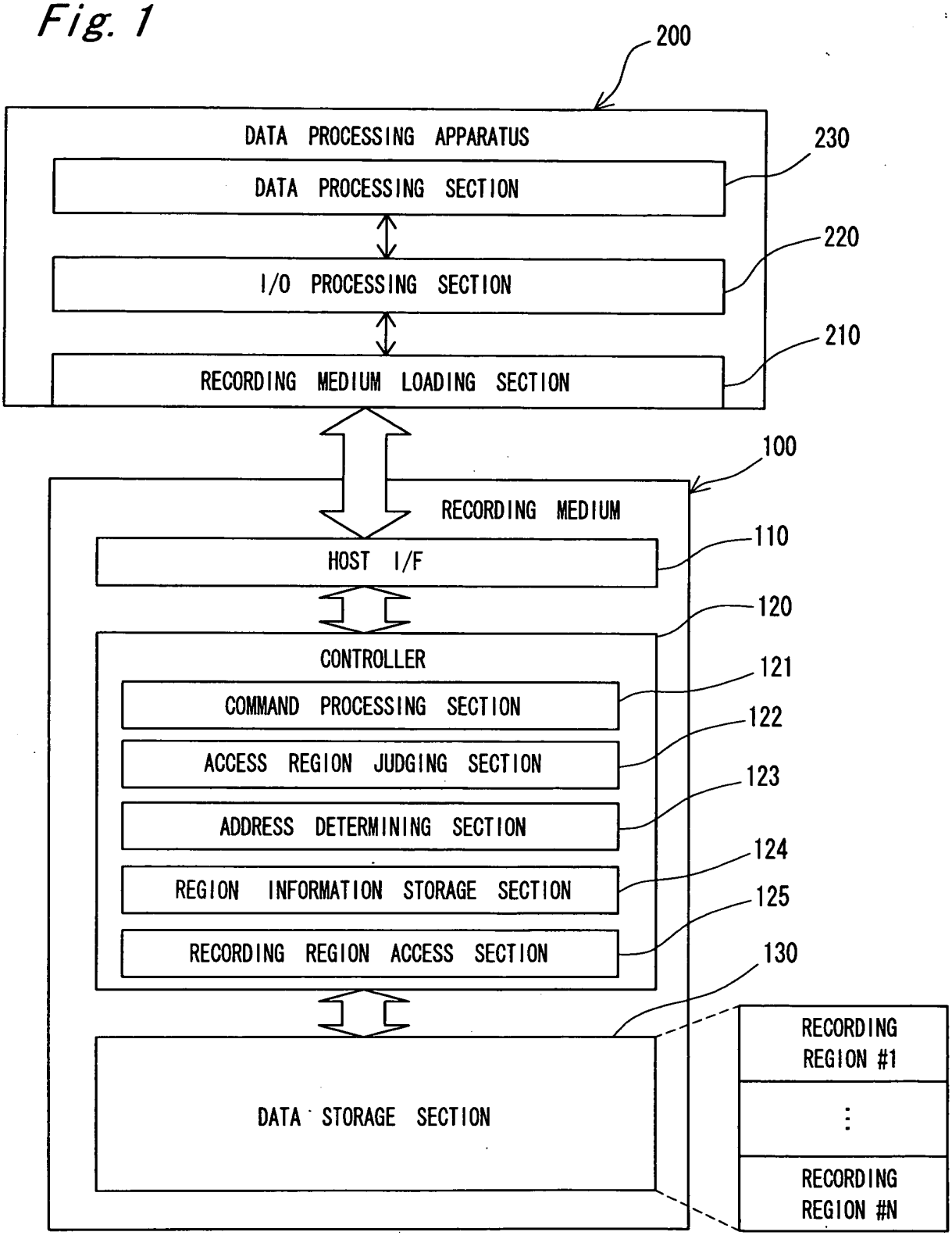
200
DATA PROCESSING APPARATUS
230
DATA PROCESSING SECTION
220
I/O PROCESSING SECTION
210
RECORDING MEDIUM LOADING SECTION
100
RECORDING MEDIUM
110
HOST I/F
120
CONTROLLER
121
COMMAND PROCESSING SECTION
122
ACCESS REGION JUDGING SECTION
123
ADDRESS DETERMINING SECTION
124
REGION INFORMATION STORAGE SECTION
125
RECORDING REGION ACCESS SECTION
130
DATA STORAGE SECTION
RECORDING REGION #1
RECORDING REGION #N

Fig. 2

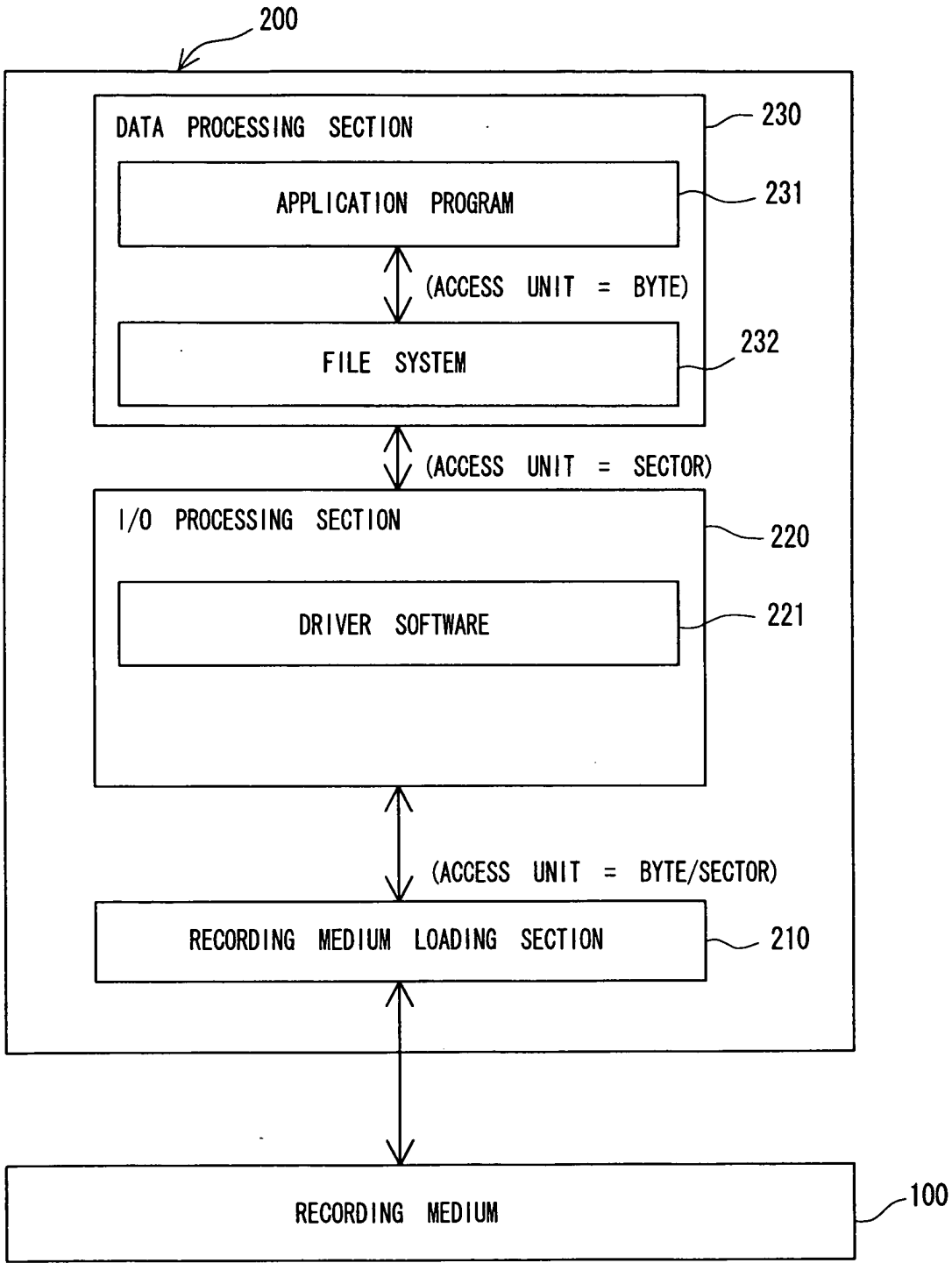
200
DATA PROCESSING SECTION
230
APPLICATION PROGRAM
231
(ACCESS UNIT = BYTE)
FILE SYSTEM
232
(ACCESS UNIT = SECTOR)
I/O PROCESSING SECTION
220
DRIVER SOFTWARE
221
(ACCESS UNIT = BYTE/SECTOR)
RECORDING MEDIUM LOADING SECTION
210
RECORDING MEDIUM
100

Fig.3

124

REGION INFORMATION STORAGE SECTION

REGION IDENTIFICATION NUMBER	START ADDRESS	REGION SIZE	ADDRESS ATTRIBUTE	VALIDITY FLAG	...
1	0	100MB	0 (BYTE)	1 (VALID)	...
2	100MB	30MB	0 (BYTE)	0 (INVALID)	...
3	130MB	8GB	1 (SECTOR)	0 (INVALID)	...
⋮	⋮	⋮	⋮	⋮	⋮
N	10GB	6GB	1 (SECTOR)	0 (INVALID)	...

Fig.4A

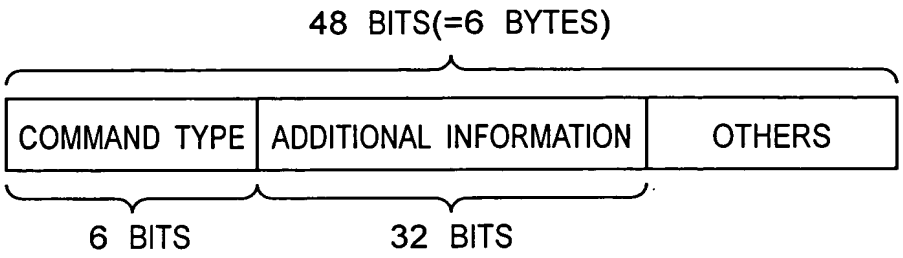

Fig.4B

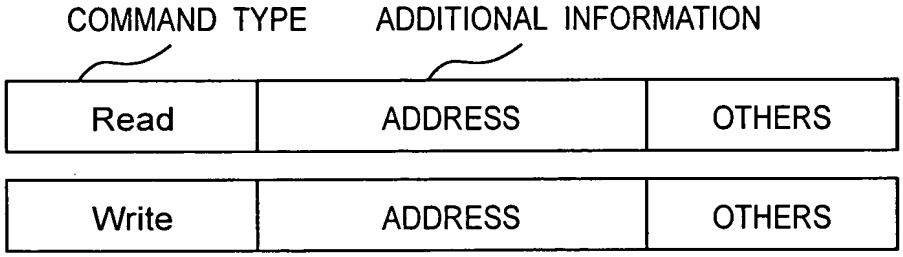

Fig.4C

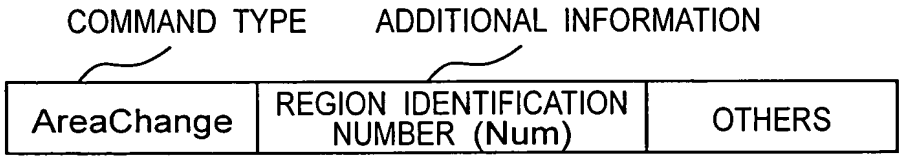

Fig.5

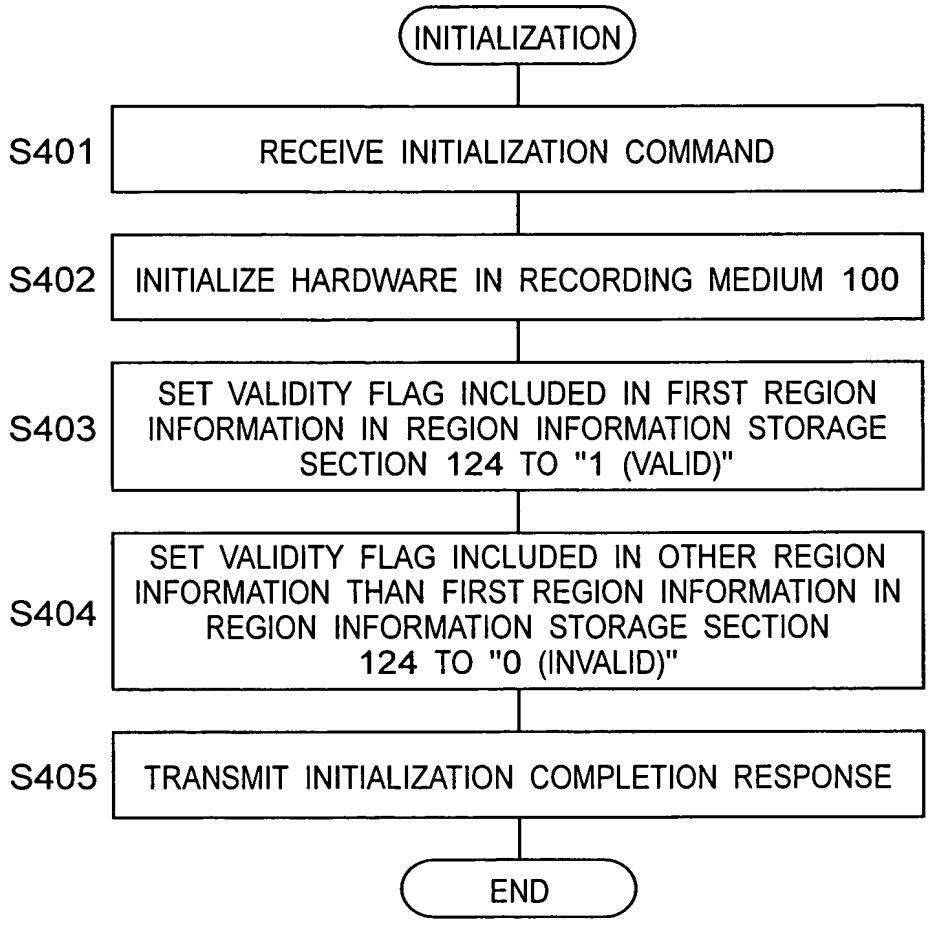
INITIALIZATION
S401
RECEIVE INITIALIZATION COMMAND
S402
INITIALIZE HARDWARE IN RECORDING MEDIUM 100
S403
SET VALIDITY FLAG INCLUDED IN FIRST REGION INFORMATION IN REGION INFORMATION STORAGE SECTION 124 TO "1 (VALID)"
S404
SET VALIDITY FLAG INCLUDED IN OTHER REGION INFORMATION THAN FIRST REGION INFORMATION IN REGION INFORMATION STORAGE SECTION 124 TO "0 (INVALID)"
S405
TRANSMIT INITIALIZATION COMPLETION RESPONSE
END

Fig.6

124

REGION INFORMATION STORAGE SECTION

REGION IDENTIFICATION NUMBER	START ADDRESS	REGION SIZE	ADDRESS ATTRIBUTE	VALIDITY FLAG	...
1	0	100MB	0 (BYTE)	1 (VALID)	...
2	100MB	30MB	0 (BYTE)	0 (INVALID)	...
3	130MB	8GB	1 (SECTOR)	0 (INVALID)	...
⋮	⋮	⋮	⋮	⋮	⋮
N	10GB	6GB	1 (SECTOR)	0 (INVALID)	...

Fig.7

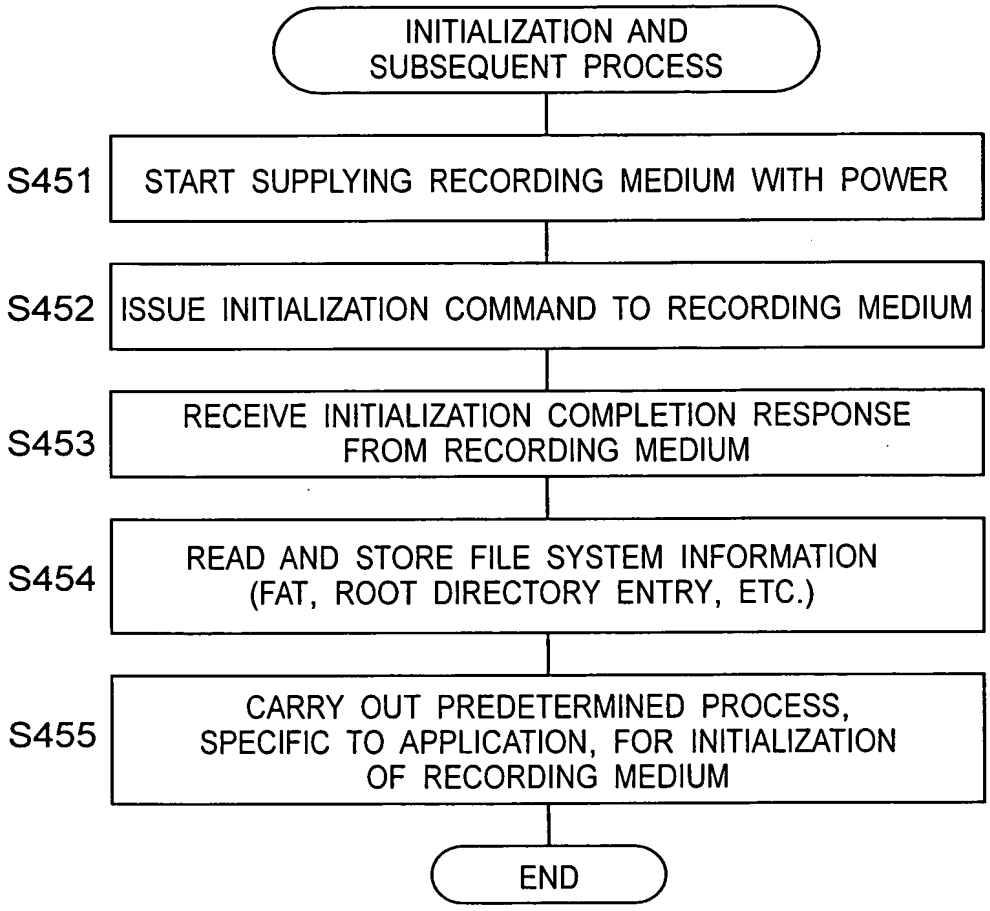
INITIALIZATION AND SUBSEQUENT PROCESS
S451
START SUPPLYING RECORDING MEDIUM WITH POWER
S452
ISSUE INITIALIZATION COMMAND TO RECORDING MEDIUM
S453
RECEIVE INITIALIZATION COMPLETION RESPONSE FROM RECORDING MEDIUM
S454
READ AND STORE FILE SYSTEM INFORMATION (FAT, ROOT DIRECTORY ENTRY, ETC.)
S455
CARRY OUT PREDETERMINED PROCESS, SPECIFIC TO APPLICATION, FOR INITIALIZATION OF RECORDING MEDIUM
END

Fig.8

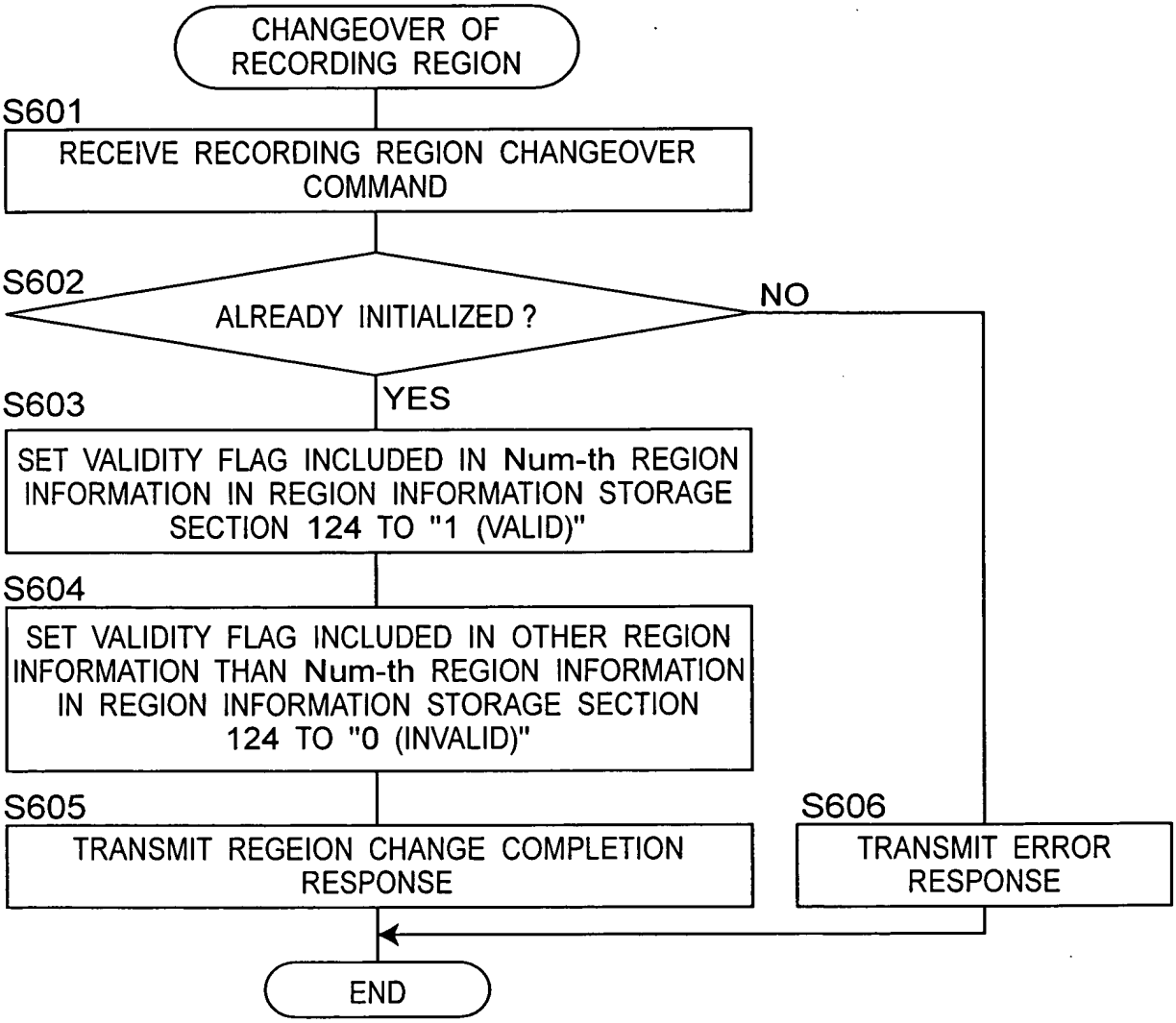
CHANGEOVER OF RECORDING REGION
S601
RECEIVE RECORDING REGION CHANGEOVER COMMAND
S602
ALREADY INITIALIZED ?
NO
YES
S603
SET VALIDITY FLAG INCLUDED IN Num-th REGION INFORMATION IN REGION INFORMATION STORAGE SECTION 124 TO "1 (VALID)"
S604
SET VALIDITY FLAG INCLUDED IN OTHER REGION INFORMATION THAN Num-th REGION INFORMATION IN REGION INFORMATION STORAGE SECTION 124 TO "0 (INVALID)"
S605
TRANSMIT REGEION CHANGE COMPLETION RESPONSE
S606
TRANSMIT ERROR RESPONSE
END

Fig.9

124

REGION INFORMATION STORAGE SECTION

REGION IDENTIFICATION NUMBER	START ADDRESS	REGION SIZE	ADDRESS ATTRIBUTE	VALIDITY FLAG	...
1	0	100MB	0 (BYTE)	0 (INVALID)	...
2	100MB	30MB	0 (BYTE)	0 (INVALID)	...
3	130MB	8GB	1 (SECTOR)	1 (VALID)	...
⋮	⋮	⋮	⋮	⋮	⋮
N	10GB	6GB	1 (SECTOR)	0 (INVALID)	...

Fig.10

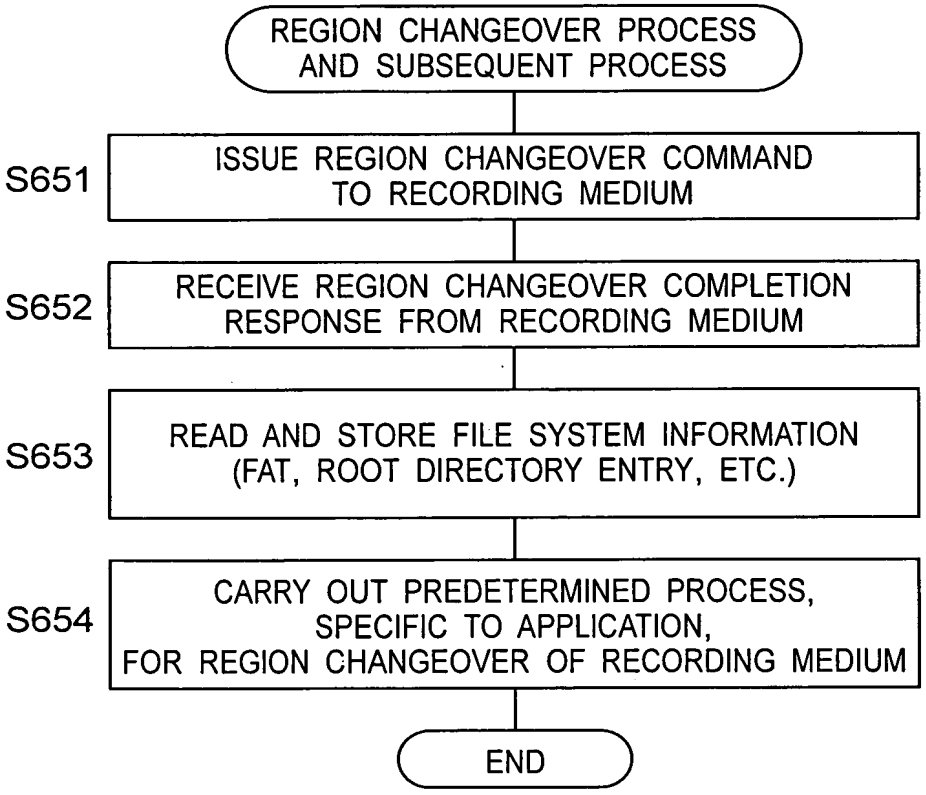
REGION CHANGEOVER PROCESS AND SUBSEQUENT PROCESS
S651
ISSUE REGION CHANGEOVER COMMAND TO RECORDING MEDIUM
S652
RECEIVE REGION CHANGEOVER COMPLETION RESPONSE FROM RECORDING MEDIUM
S653
READ AND STORE FILE SYSTEM INFORMATION (FAT, ROOT DIRECTORY ENTRY, ETC.)
S654
CARRY OUT PREDETERMINED PROCESS, SPECIFIC TO APPLICATION, FOR REGION CHANGEOVER OF RECORDING MEDIUM
END

Fig.11

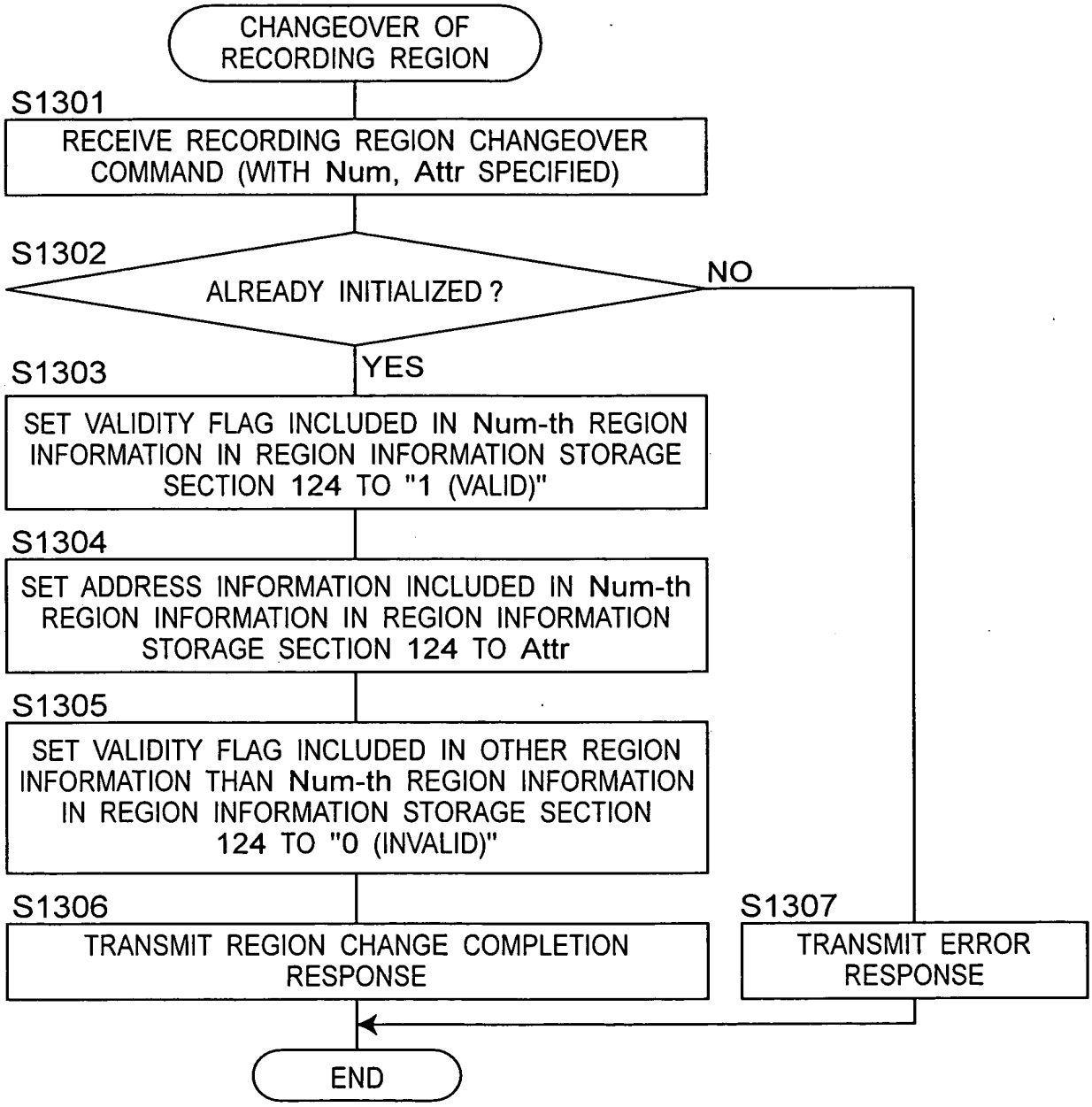
CHANGEOVER OF RECORDING REGION
S1301
RECEIVE RECORDING REGION CHANGEOVER COMMAND (WITH Num, Attr SPECIFIED)
S1302
ALREADY INITIALIZED ?
NO
YES
S1303
SET VALIDITY FLAG INCLUDED IN Num-th REGION INFORMATION IN REGION INFORMATION STORAGE SECTION 124 TO "1 (VALID)"
S1304
SET ADDRESS INFORMATION INCLUDED IN Num-th REGION INFORMATION IN REGION INFORMATION STORAGE SECTION 124 TO Attr
S1305
SET VALIDITY FLAG INCLUDED IN OTHER REGION INFORMATION THAN Num-th REGION INFORMATION IN REGION INFORMATION STORAGE SECTION 124 TO "0 (INVALID)"
S1306
TRANSMIT REGION CHANGE COMPLETION RESPONSE
S1307
TRANSMIT ERROR RESPONSE
END

Fig.12

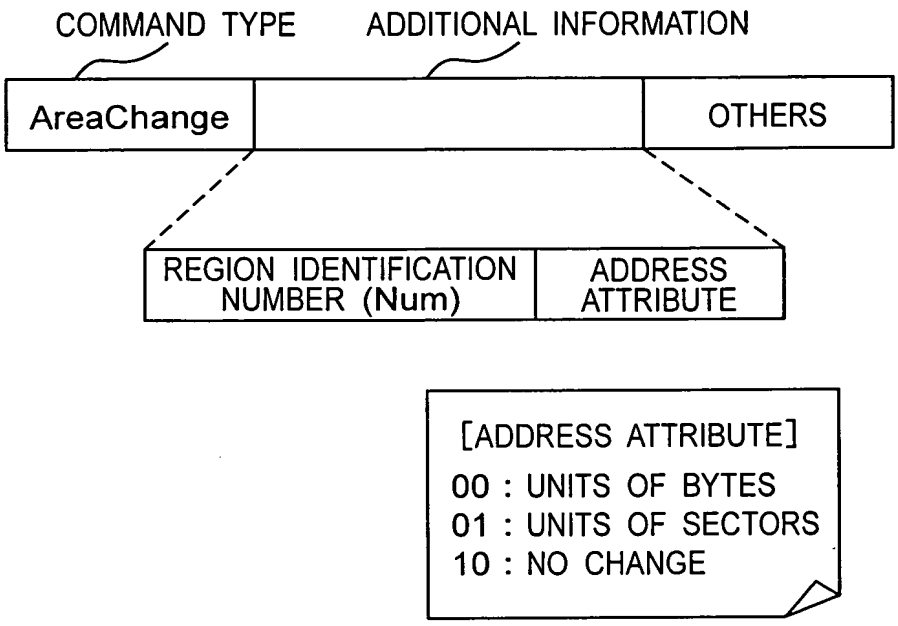
COMMAND TYPE
ADDITIONAL INFORMATION
AreaChange
OTHERS
REGION IDENTIFICATION NUMBER (Num)
ADDRESS ATTRIBUTE
[ADDRESS ATTRIBUTE]
00 : UNITS OF BYTES
01 : UNITS OF SECTORS
10 : NO CHANGE

Fig.13

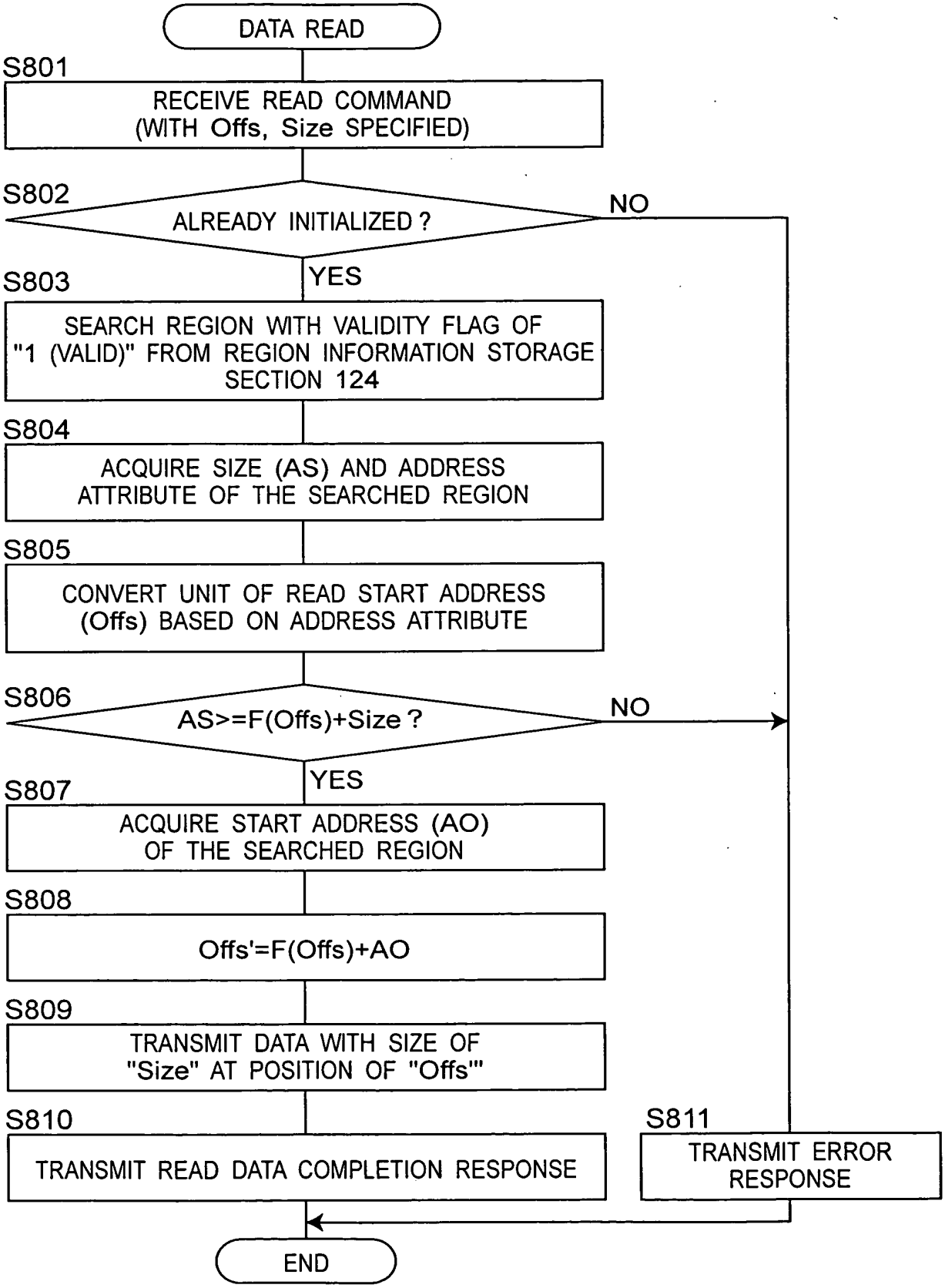
DATA READ
S801
RECEIVE READ COMMAND (WITH Offs, Size SPECIFIED)
S802
ALREADY INITIALIZED ?
NO
YES
S803
SEARCH REGION WITH VALIDITY FLAG OF "1 (VALID)" FROM REGION INFORMATION STORAGE SECTION 124
S804
ACQUIRE SIZE (AS) AND ADDRESS ATTRIBUTE OF THE SEARCHED REGION
S805
CONVERT UNIT OF READ START ADDRESS (Offs) BASED ON ADDRESS ATTRIBUTE
S806
AS>=F(Offs)+Size ?
NO
YES
S807
ACQUIRE START ADDRESS (AO) OF THE SEARCHED REGION
S808
Offs'=F(Offs)+AO
S809
TRANSMIT DATA WITH SIZE OF "Size" AT POSITION OF "Offs'"
S810
TRANSMIT READ DATA COMPLETION RESPONSE
S811
TRANSMIT ERROR RESPONSE
END

Fig.14

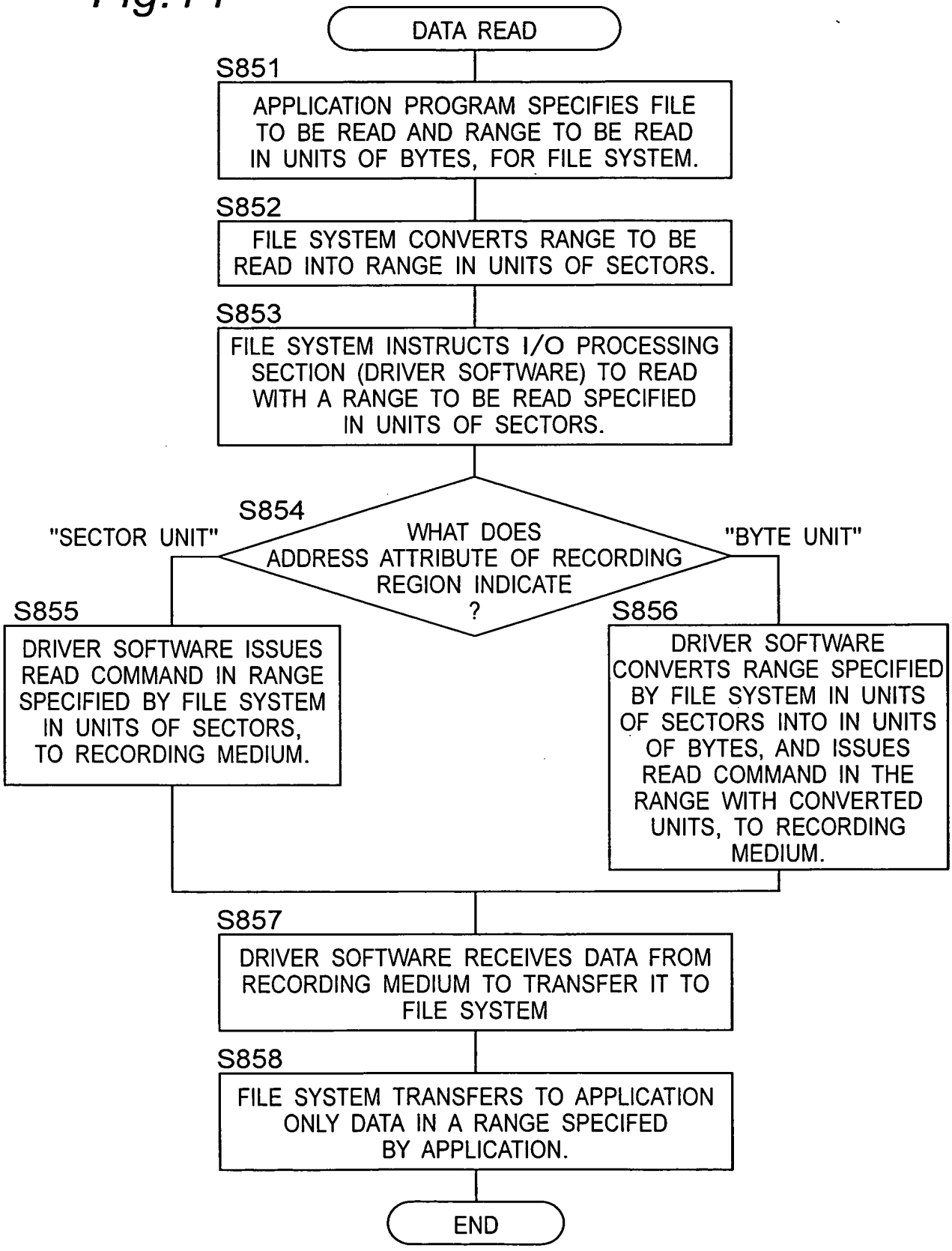
DATA READ
S851
APPLICATION PROGRAM SPECIFIES FILE TO BE READ AND RANGE TO BE READ IN UNITS OF BYTES, FOR FILE SYSTEM.
S852
FILE SYSTEM CONVERTS RANGE TO BE READ INTO RANGE IN UNITS OF SECTORS.
S853
FILE SYSTEM INSTRUCTS I/O PROCESSING SECTION (DRIVER SOFTWARE) TO READ WITH A RANGE TO BE READ SPECIFIED IN UNITS OF SECTORS.
S854
WHAT DOES ADDRESS ATTRIBUTE OF RECORDING REGION INDICATE ?
"SECTOR UNIT"
"BYTE UNIT"
S855
DRIVER SOFTWARE ISSUES READ COMMAND IN RANGE SPECIFIED BY FILE SYSTEM IN UNITS OF SECTORS, TO RECORDING MEDIUM.
S856
DRIVER SOFTWARE CONVERTS RANGE SPECIFIED BY FILE SYSTEM IN UNITS OF SECTORS INTO IN UNITS OF BYTES, AND ISSUES READ COMMAND IN THE RANGE WITH CONVERTED UNITS, TO RECORDING MEDIUM.
S857
DRIVER SOFTWARE RECEIVES DATA FROM RECORDING MEDIUM TO TRANSFER IT TO FILE SYSTEM
S858
FILE SYSTEM TRANSFERS TO APPLICATION ONLY DATA IN A RANGE SPECIFED BY APPLICATION.
END

Fig.15

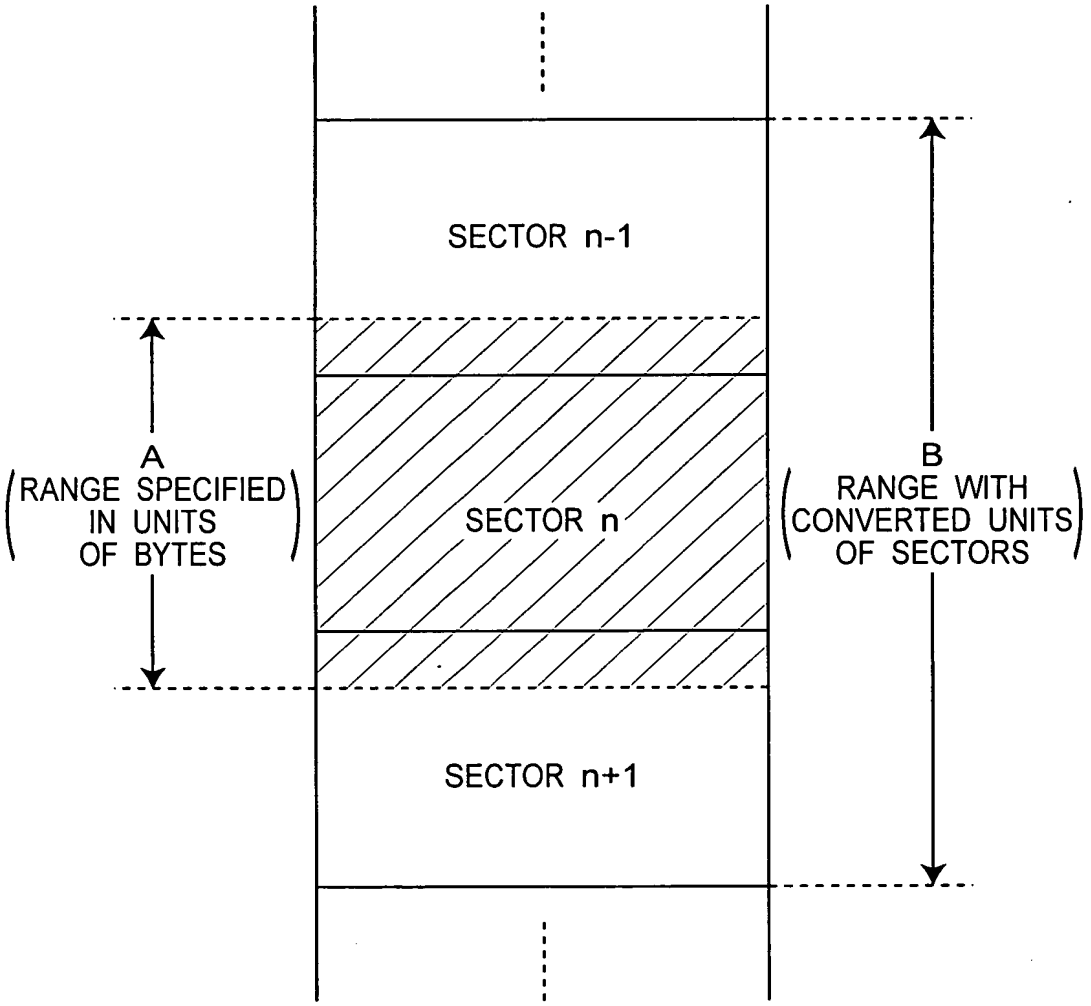
SECTOR n-1
SECTOR n
SECTOR n+1
A
(RANGE SPECIFIED IN UNITS OF BYTES)
B
(RANGE WITH CONVERTED UNITS OF SECTORS)

Fig.16A

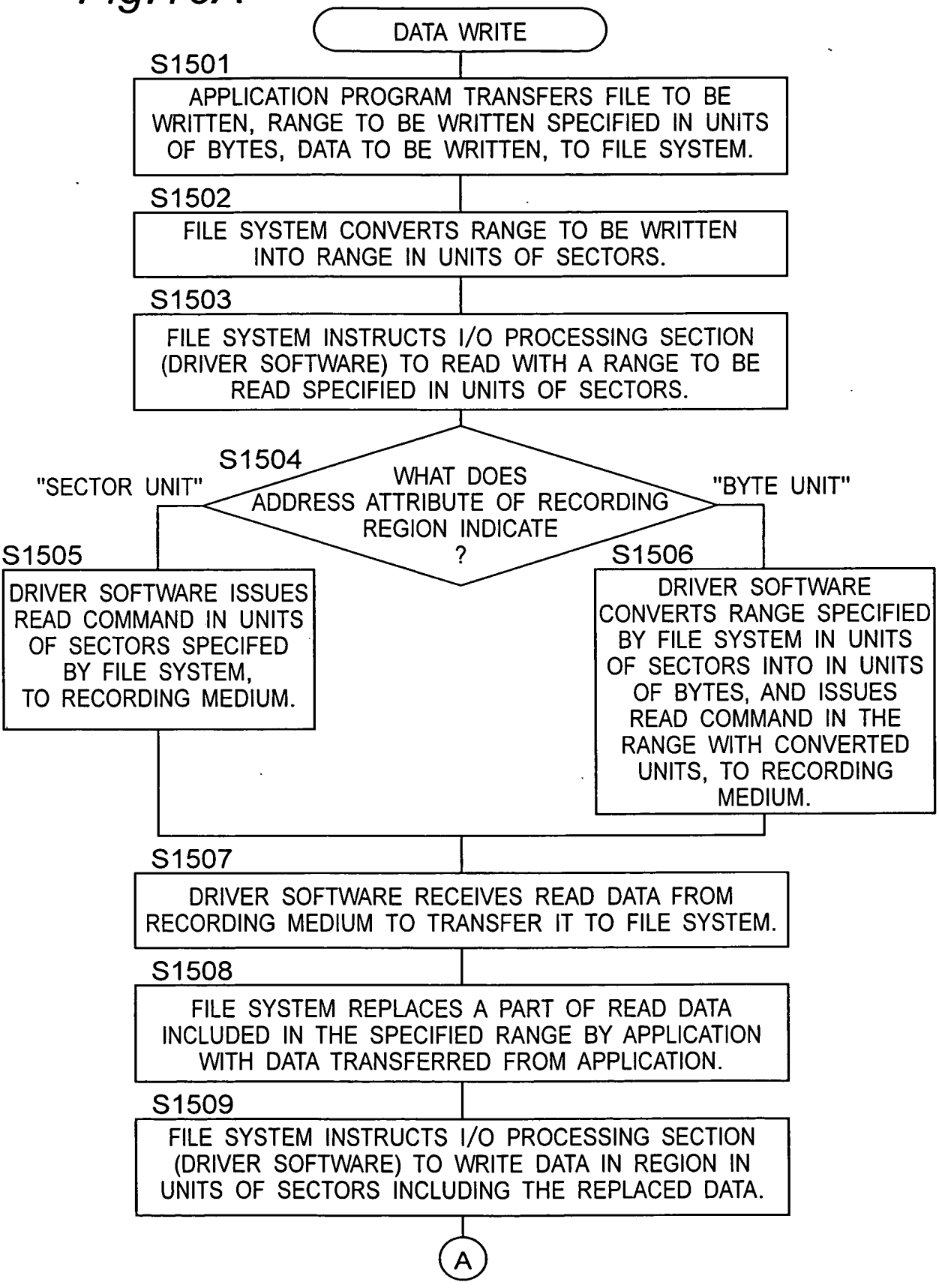
DATA WRITE
S1501
APPLICATION PROGRAM TRANSFERS FILE TO BE WRITTEN, RANGE TO BE WRITTEN SPECIFIED IN UNITS OF BYTES, DATA TO BE WRITTEN, TO FILE SYSTEM.
S1502
FILE SYSTEM CONVERTS RANGE TO BE WRITTEN INTO RANGE IN UNITS OF SECTORS.
S1503
FILE SYSTEM INSTRUCTS I/O PROCESSING SECTION (DRIVER SOFTWARE) TO READ WITH A RANGE TO BE READ SPECIFIED IN UNITS OF SECTORS.
S1504
WHAT DOES ADDRESS ATTRIBUTE OF RECORDING REGION INDICATE ?
"SECTOR UNIT"
"BYTE UNIT"
S1505
DRIVER SOFTWARE ISSUES READ COMMAND IN UNITS OF SECTORS SPECIFED BY FILE SYSTEM, TO RECORDING MEDIUM.
S1506
DRIVER SOFTWARE CONVERTS RANGE SPECIFIED BY FILE SYSTEM IN UNITS OF SECTORS INTO IN UNITS OF BYTES, AND ISSUES READ COMMAND IN THE RANGE WITH CONVERTED UNITS, TO RECORDING MEDIUM.
S1507
DRIVER SOFTWARE RECEIVES READ DATA FROM RECORDING MEDIUM TO TRANSFER IT TO FILE SYSTEM.
S1508
FILE SYSTEM REPLACES A PART OF READ DATA INCLUDED IN THE SPECIFIED RANGE BY APPLICATION WITH DATA TRANSFERRED FROM APPLICATION.
S1509
FILE SYSTEM INSTRUCTS I/O PROCESSING SECTION (DRIVER SOFTWARE) TO WRITE DATA IN REGION IN UNITS OF SECTORS INCLUDING THE REPLACED DATA.
A

Fig.16B

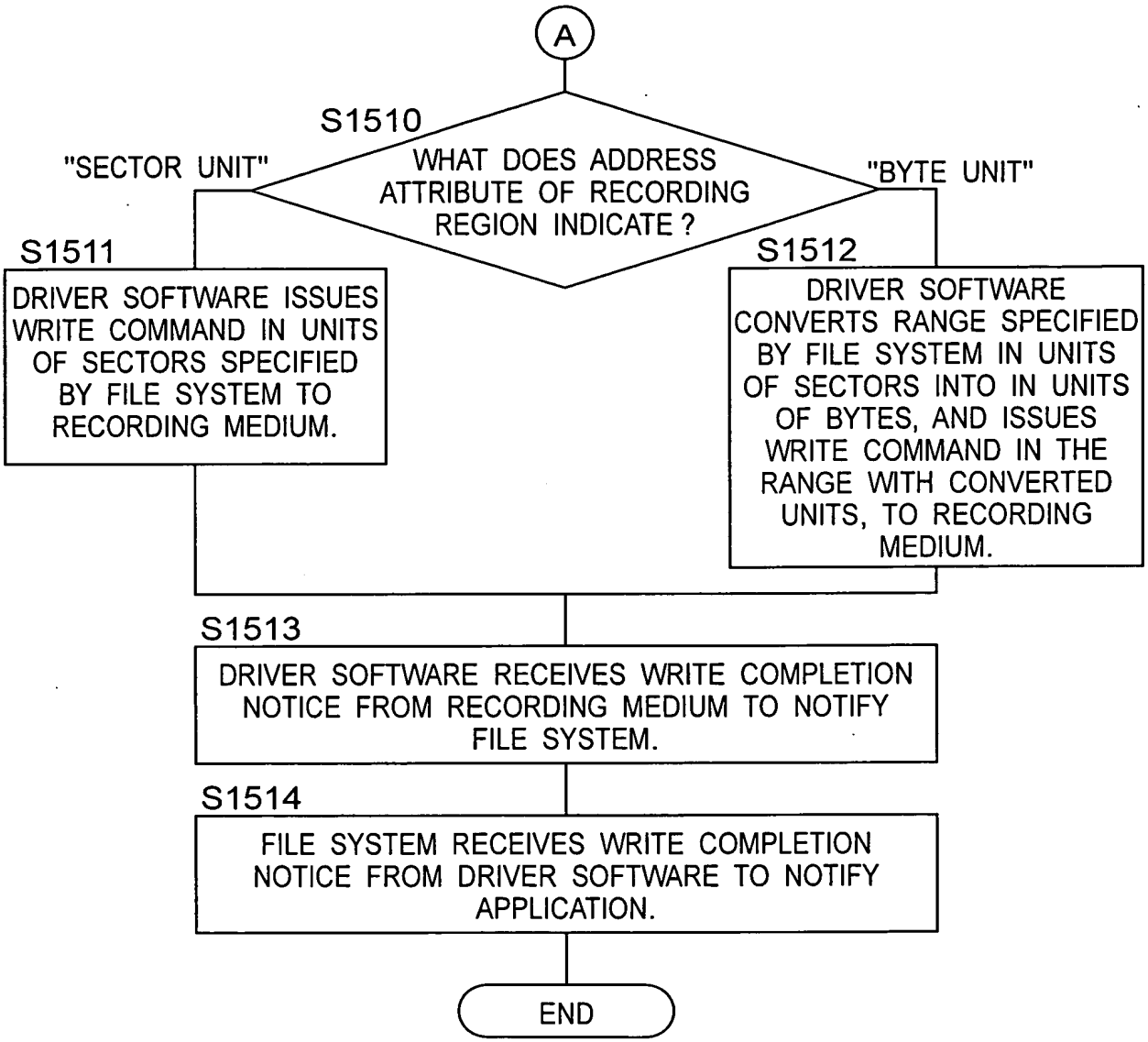
A
S1510
WHAT DOES ADDRESS ATTRIBUTE OF RECORDING REGION INDICATE ?
"SECTOR UNIT"
"BYTE UNIT"
S1511
DRIVER SOFTWARE ISSUES WRITE COMMAND IN UNITS OF SECTORS SPECIFIED BY FILE SYSTEM TO RECORDING MEDIUM.
S1512
DRIVER SOFTWARE CONVERTS RANGE SPECIFIED BY FILE SYSTEM IN UNITS OF SECTORS INTO IN UNITS OF BYTES, AND ISSUES WRITE COMMAND IN THE RANGE WITH CONVERTED UNITS, TO RECORDING MEDIUM.
S1513
DRIVER SOFTWARE RECEIVES WRITE COMPLETION NOTICE FROM RECORDING MEDIUM TO NOTIFY FILE SYSTEM.
S1514
FILE SYSTEM RECEIVES WRITE COMPLETION NOTICE FROM DRIVER SOFTWARE TO NOTIFY APPLICATION.
END

Fig.17

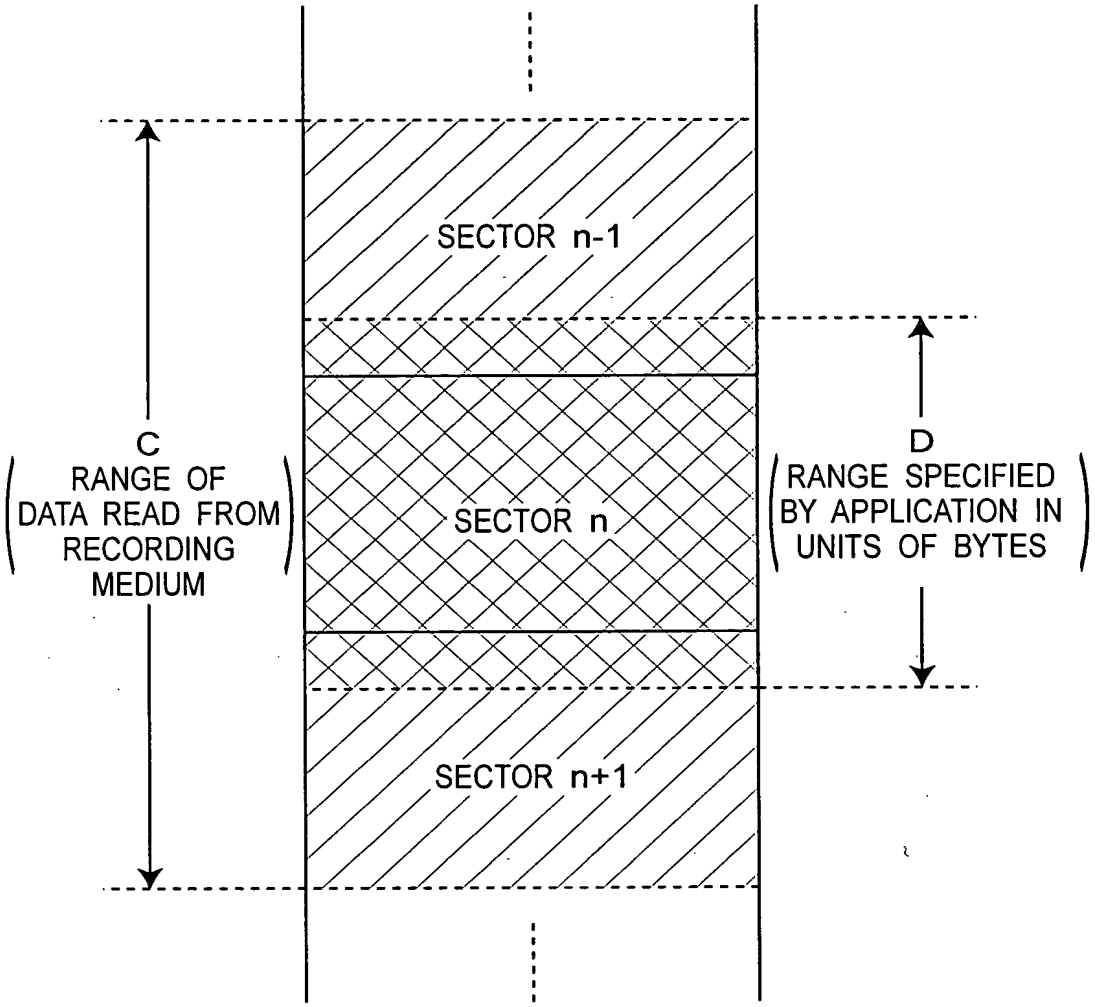
SECTOR n-1
SECTOR n
SECTOR n+1
C
RANGE OF DATA READ FROM RECORDING MEDIUM
D
RANGE SPECIFIED BY APPLICATION IN UNITS OF BYTES

Fig.18

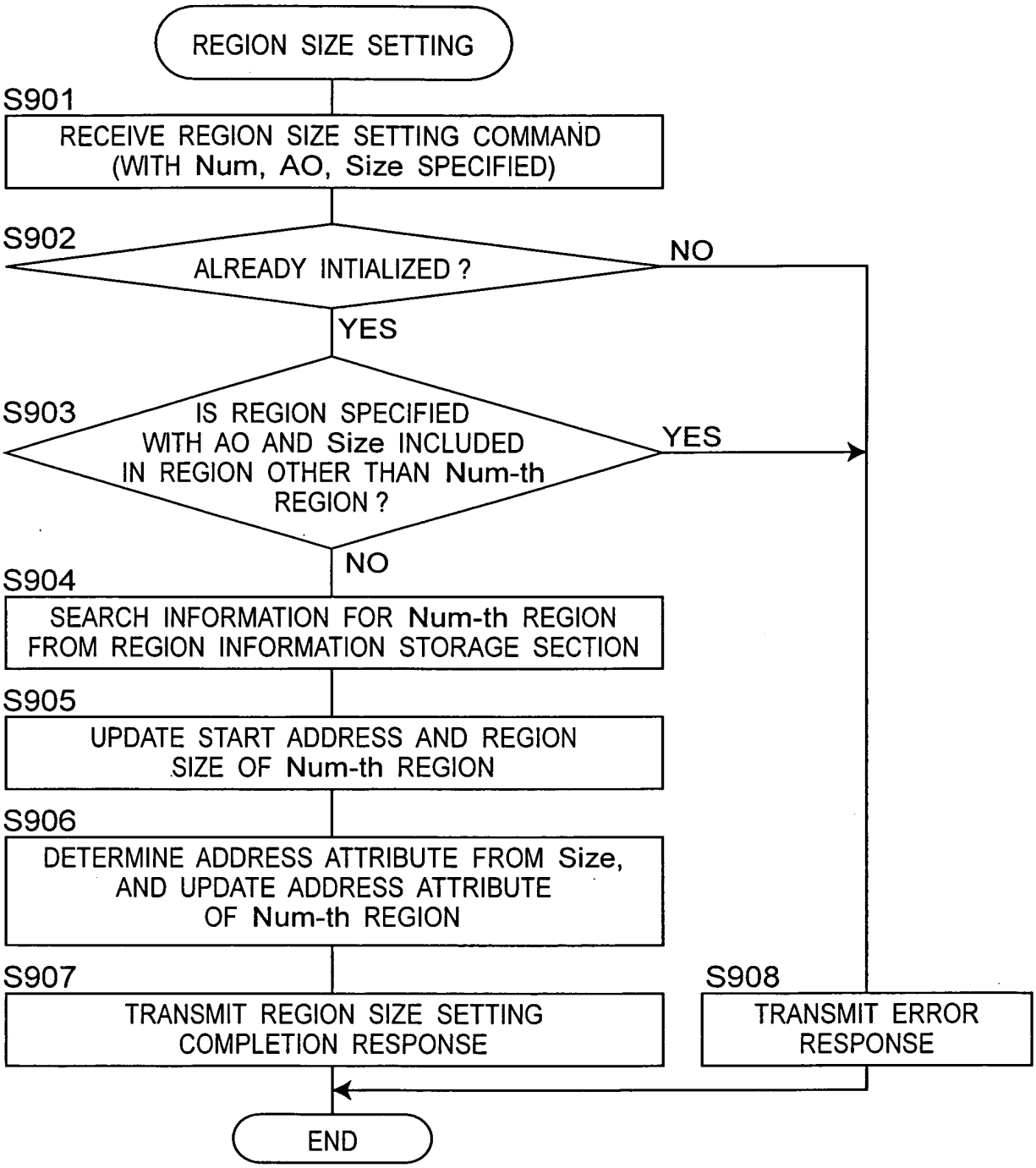
REGION SIZE SETTING
S901
RECEIVE REGION SIZE SETTING COMMAND (WITH Num, AO, Size SPECIFIED)
S902
ALREADY INTIALIZED ?
NO
YES
S903
IS REGION SPECIFIED WITH AO AND Size INCLUDED IN REGION OTHER THAN Num-th REGION ?
YES
NO
S904
SEARCH INFORMATION FOR Num-th REGION FROM REGION INFORMATION STORAGE SECTION
S905
UPDATE START ADDRESS AND REGION SIZE OF Num-th REGION
S906
DETERMINE ADDRESS ATTRIBUTE FROM Size, AND UPDATE ADDRESS ATTRIBUTE OF Num-th REGION
S907
TRANSMIT REGION SIZE SETTING COMPLETION RESPONSE
S908
TRANSMIT ERROR RESPONSE
END

Fig.19

	COMMAND TYPE	ADDITIONAL INFORMATION	
(a)	AreaChange	REGION IDENTIFICATION NUMBER (Num)	OTHERS
(b)	SetAO	ADDRESS	OTHERS
(c)	SetSize	SIZE (IN SECTOR UNIT)	OTHERS
(d)	Change AreaSize	DUMMY DATA	OTHERS

Fig.20

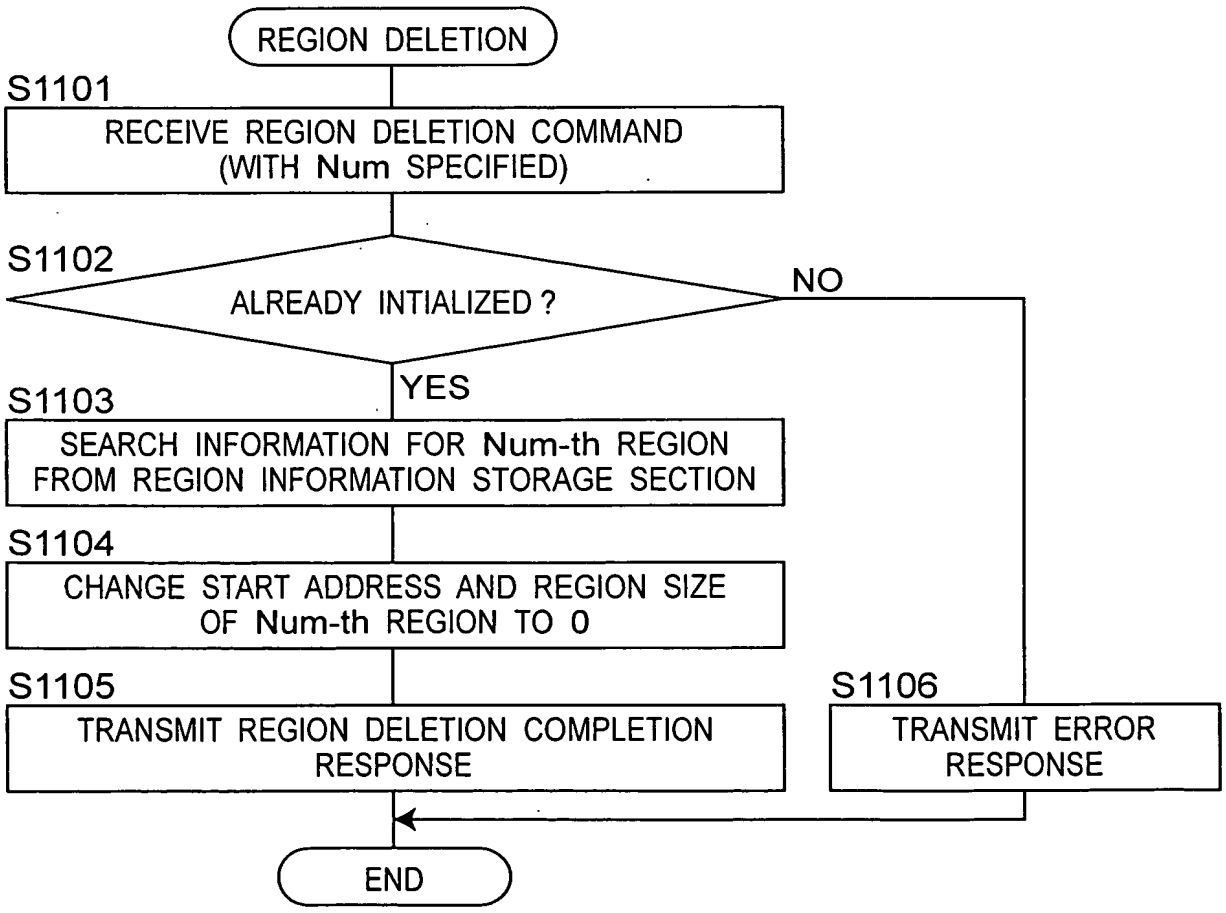

Fig.21

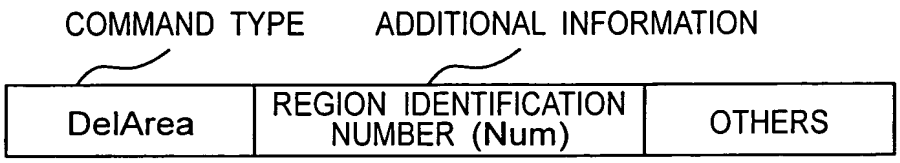
COMMAND TYPE
ADDITIONAL INFORMATION
DelArea
REGION IDENTIFICATION NUMBER (Num)
OTHERS

Fig.22

124

REGION INFORMATION STORAGE SECTION

REGION IDENTIFICATION NUMBER	START ADDRESS	REGION SIZE	ADDRESS ATTRIBUTE	COMMAND SET	COMMAND FORMAT	VALIDITY FLAG	...
1	0	100MB	0 (BYTE)	1	1	1 (VALID)	...
2	100MB	30MB	0 (BYTE)	2	2	0 (INVALID)	...
3	130MB	8GB	1 (SECTOR)	3	2	0 (INVALID)	...
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
N	10GB	6GB	1 (SECTOR)	3	4	0 (INVALID)	...
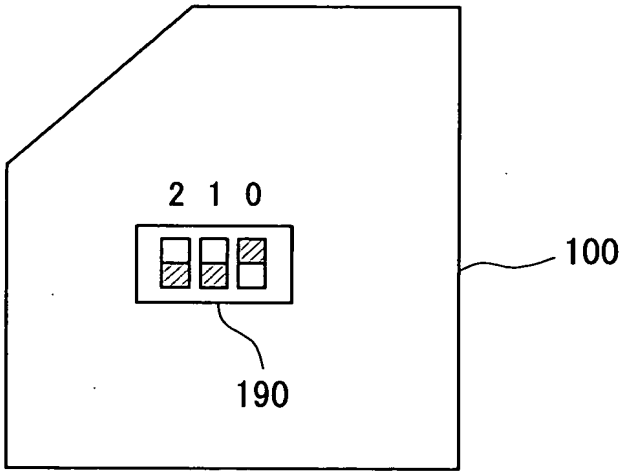
Fig. 23